

A comprehensive range of standard peripheral equipment is available for use within the system, and where it is required non-standard and customer built devices may be connected either separately or in conjunction with standard equipment.

The standard peripheral devices currently available includes:

Input/Output Typewriters

P841-101 Normal ASR typewriter including paper tape reader/punch, current loop interface.

P841-105 The same as P841-001 but with V24 interface.

P842-001 PER3100 Matrix printer with keyboard, V24 interface.

P842-002 PER3100 Matrix printer with keyboard, current loop interface.

Punched Tape Equipment

P801-001 Punched Tape Reader, 333 char per sec.

P802-001 Punched Tape Reader, 600 char per sec.

P803-001 Tape Punch, 75 char per sec.

Card Reader

P806-102 Punched card reader, 300 cards per minute.

Line Printers

P809-002 Matrix line printer, 200 lines per minute, 132 col.

P811-001 Line printer, 245 lines per minute, 132 col.

P812-001 Line printer, 670 lines per minute, 132 col.

P842-003 PER3100 Matrix printer without keyboard, V24 interface.

P842-004 PER3100 Matrix printer without keyboard, current loop interface.

Cassette Tape Equipment

P833-001 Cassette tape drive unit, 7.5 ips, 800 bpi.

Magnetic Tape Equipment

P831-002 Magnetic tape drive, 25 ips, 800 bpi, 9-track.

P831-004 Magnetic tape drive, 45 ips, 800 bpi, 9-track.

P831-006 Magnetic tape drive, 37.5 ips, 1600 bpi, 9-track.

Magnetic disc equipment

P824-002 Moving head disc drive, 2.7M bytes

P825-007 Moving head disc drive, 40M bytes

Display Equipment

P818-001 Display, current loop interface.
P818-002 Display, V24 interface.

POWER SUPPLIES

The necessary power supplies for all the standard peripheral devices are produced by either self-contained power supply units or by a separate unit mounted together with the device in either the basic cabinet or an equipment shelf. Power supplies for the associated control unit are derived from the power supplies within the mounting boxes and equipment shelves or from the peripheral's separate power supply.

CONNECTION TO THE SYSTEM

The connection of standard peripheral devices to the system is carried out using a control unit and transfers will take place via the programmed or an input/output processor channel. Using either the programmed or an input/output processor channel, transfer rates up to the maximum operating speed of the device are possible and in normal circumstances these rates will always be maintained, the rate only being reduced when the servicing of the programmed or input/output processor channel concerned is slow.

CONTROL UNITS

Certain control units which are connected directly to the general purpose bus are of a multiple type (MCU), that is more than one control unit is mounted on a single printed circuit board. The configuration of MCU's and the availability of control units for connection to the system are:

Multiple Control Units (MCU's)

Multiple control units for use with PTR, PTP, V24 serial CU, LP and CR are available in the following configurations:

1. PTR/PTP/V24 serial CU.
2. PTR/PTP.
3. LP/CR.

CU's for all the devices mentioned above except the PTP and CR are also available as single control units.

Connection details for standard control units

Type Number	CU	Channel Connection		Int/Breaks	Remarks
		Prog. Chan.	I/O Proc.		
P801-040	PTR	x	o	1	separate CU
P840-001	PTR	x	o	2	multiple CU
	PTP	x	o		
P840-002	PTR	x	o	3	multiple CU
	PTP	x	o		
	V24	x	o		
P840-003	CR	o	x	2	multiple CU
	LP	o	x		
P810-040	LP	o	x	1	separate CU
P845-040	V24	x	o	1	separate CU
P831-040	MT	o	x	1	CU for 4 drives
	Disc	-	x	1	CU for 2 drives
P824-040	Disc	-	x	1	CU for 2 drives
P825-040	Disc 40 Mb	-	x	1	CU for 2 drives
P833-152	Cass Tape	x	x	1	CU for 3 drives
P837-001	DIOD 2 words	o	o	1	
P837-002	DIOD 4 words	o	o	2	
P847-060	SLCU25	x	x	2	
P847-070	SLCU4	x	x	4	
P846-060	ALCU2	x	x	2	
P846-070	ALCU4	x	x	4	
P845-060	AM/A8A	x	x	2	
P845-070	AM/A8C	x	x	2	
P844-060	AM/A16	x	-	1	
P844-110	V28CM	x	-	1	

Note: o means that connection to the channel is possible but not supported by standard software.

- x connection supported by standard software.
- connection not possible to the channel.

The connection of non-standard devices to the system must also be made via a control unit and standard boards are available on which the customer may assemble his own control units. Boards are available without any logic circuits (printed circuit boarding) or with standard address and function decode logic and interrupt encoding already mounted and connected (General Purpose Cards).

INPUT/OUTPUT TYPEWRITERS

P841-101 Typewriter

Figure 17.1 shows the P841 typewriter.

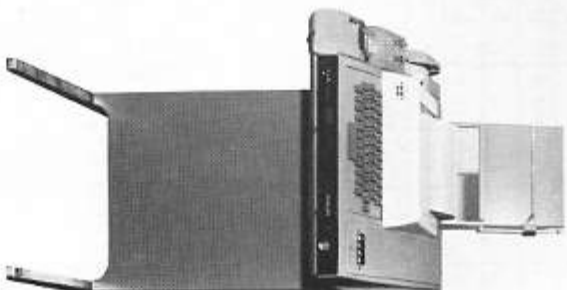


Figure 17.1

The P841-101 is a normal duty typewriter (ASR33) with attached paper tape reader/punch equipment. All the facilities operate at a maximum transfer speed of 10 characters per second, and may be operated on or off line to the system, switching being carried out at the typewriter.

Connection to the System

Connection to the system is with current loop interface.

Main Controls

Mode Switch - A three position switch mounted on the front of the typewriter, used to control the mode of operation of the typewriter.

- OFF Typewriter switched OFF.
- LOCAL Typewriter and paper tape equipment are operative but are not connected to the system.
- LINE Typewriter and paper tape equipment are operative and connected to the system.

Paper Tape Reader Switch - A three position switch mounted on the top of the paper tape reader.

- START Paper tape reader is started manually if the Mode Switch is in either the LINE or LOCAL position.
- NEUTRAL Paper tape reader is operative and may be started or stopped by the system if the Mode Switch is in the LINE position.
- STOP Paper tape reader is stopped manually by pressing the switch towards the free position.
- FREE The paper feed is freed and the tape may be repositioned in the reader without completely releasing it from the mechanism.

Paper Tape Punch Controls - Four individual push button controls mounted on the top of the punch.

- ON The punch is started manually if the Mode switch is in either the LINE or LOCAL position.
- OFF The punch is stopped manually.

Note. The punch may be started and stopped by the system if the mode switch is in the LINE position.

REL The tape is released and may be threaded through the punch as required.

BS The tape is back spaced one character each time the button is depressed. This facility should only be used when the punch is operating LOCAL and is stopped.

Basic Specifications

- Operating Speed - 10 characters per second.
- Size - Width 560 mm, Height 1140 mm, Depth 470 mm.
- Weight - 25 Kilograms.
- Paper Width - 216 mm.
- Power - 300 V.A.

Operating Temperature - 0 - 45°C.
Relative Humidity - 20 - 80%

P841-105 Typewriter

This typewriter is the same as the P841-101 but with V24 interface. It may be connected to the integrated V24 control unit or the multiple control unit, or asynchronous Data Communication control units.

P842-001 PER3100 Matrix Printer

Figure 17.2 shows the P842-001 matrix printer and keyboard with V24 interface.

The P842-001 matrix printer and keyboard offers the same basic facilities as the typewriter without attached paper tape equipment. It is capable of near silent operation at up to 50 characters per second and may use peg or friction fed paper of various widths, multiple copies being available when peg fed paper is used.



Figure 17.2

Line spacing of 1, 1½, or 2 normal lines and LOCAL/ON LINE/OFF operation are selectable at the printer. Various keyboard layouts and character sets are available, including the possibility of up to 7 special characters on option.

Connection to the System

Connection to the system may be via the programmed or input/output processor channel and is made via the V24 serial control unit.

In all cases the maximum printer speed is 50 characters per second although the actual speed of transfer will depend on the control unit, interfacing, and program being used. The available interface boards enable: transfer speeds of 100-9600 baud to be selected in specific steps. Where transfer rates of above 50 characters per second occur or in the case of certain special characters the controlling program must insert sufficient null characters to avoid the loss of data.

Main Controls

Power On/Off Switch - An external two position switch, used by the operator to switch the mains power to the printer On or Off.

Operational Switch - An external two position switch, used by the operator in certain cases to make the printer operable.

Continuous Line Feed Switch - An external spring loaded switch, which whilst depressed causes line feeding of the paper to occur continuously.

Apart from the mentioned switches internal links exist on the standard interface boards within the printer, for the selection of line speed and to enable an echo print facility if this is required.

Basic Specifications

Operating Speed

- Up to 50 characters per second.

Size

- Width 510 mm, height 170 mm, Depth 310 mm, without keyboard, 465 with keyboard.

Weight

- 20 Kilograms.

Paper Width

- 231.8 mm, 203.2 mm and 314.3 mm (perforation distance).

Peg Fed

- 148 mm to 306.3 mm.

Friction Fed

- 100 VA Average.

Power

- Operating Temperature - 10° - 40°C operating.

Relative Humidity

- 20 - 80% operating.

P842-002

This is the same printer as the P842-001 but with current loop interface and the following additional switches:

Line Spacing Switch - A three position switch mounted on the KSR interface board and used to select the required line spacing when the KSR interface board is fitted.

Mode Switch - A three position switch mounted on the KSR interface board within the printer and easily accessible by the operator. The switch is used to control the mode of operation of the printer when the KSR interface board is used:

OFF

Printer does not accept either line or keyboard inputs. The main power supply to the printer is not effected by this switch and may be ON.

LOCAL

Printer interface is operable from the keyboard only, no line signals are sent or accepted by the printer.

ON LINE

Printer interface is operable and may accept both line and keyboard inputs. Keyboard inputs are also retransmitted as line outputs.

P842-003 As P842-001, but without keyboard.

P842-004 As P842-002, but without keyboard.

PUNCHED TAPE EQUIPMENT

P801-001 Punched Tape Reader

Figure 17.3 shows the P801-001 Punched tape reader.

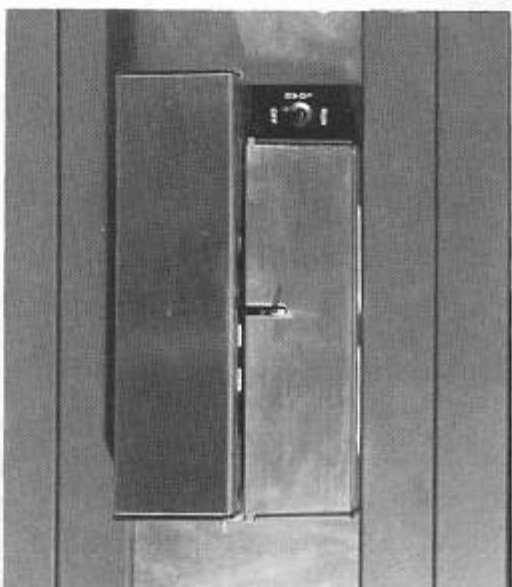


Figure 17.3

The P801-001 punched tape reader provides the system with the ability to read a wide range of punched paper tapes at a speed of up to 333 characters per second.

The reading assembly is of the photo-electric type and raises data and timing signals at TTL levels, 8 data channels and 1 timing channel being available. The Tape drive unit controls the movement of the tape across the readhead via a drive motor and associated pinch roller and brake assemblies. No adjustment via a drive motor is necessary when tapes between 0.064 to 0.124 mm (0.0025" to 0.005") thick are used and adjustment for 17.5 mm, 21.4 mm, or 25.4 mm (11/16", 7/8", or 1") wide tape is carried out by an externally mounted control.

Connection to the System

Connection to the system may be via the programmed or an input/output processor channel.

Mounting

The complete reader, including power supply, is assembled for mounting in a standard 19" rack and may be fitted into either the basic or an extension cabinet.

Main Controls

Power Switch - A three position switch mounted on the front panel of the reader, used for switching the power on the reader.

OFF No power is switched on to the reader.

LOAD Power is supplied to the drive unit motor and reading unit, the pinch roller and brake assemblies are clear of the tape track to allow loading.

RUN Power is supplied to all the reader circuits and the reader operates under the control of the system.

Tape Width Selector - An adjustable control mounted on the side of the reader. The control is lockable and is used to adjust the tape guide mechanism as required.

Tape Load Lever - An external control on the front of the reader, used to disengage the front tape guide and allow insertion of the tape.

Basic Specifications

- Operating Speed**
- 333 characters per second.
 - Width 483 mm, Height 133 mm, Depth 203 mm.
- Weight**
- 15 Kilograms.
- Tape Size**
- Width 17.5 mm, 21.4 mm, 25.4 mm (11/16", 7/8", 1") selectable.
 - Depth 0.064 to 0.124 mm (0.0025" to 0.005") 14.12
- Power**
- 150 V.A.
- Operating Temperature**
- 0 - 45°C.
- Relative Humidity**
- 20 - 80%.

P802-001 Punched Tape Reader

In all respects apart from maximum operating speed the P802-001 is the same as the P801-001 Punched tape reader.

Operating Speed - 600 characters per second.

P803-001 Paper Tape Punch

Figure 17.4 shows the P803-001 Paper Tape Punch.



Figure 17.4

The P803-001 paper tape punch provides the system with the ability to produce a punched paper tape output at a rate of up to 75 characters per second on various width tapes. No adjustment is necessary for tapes of 0.08 to 0.11 mm (0.0031" to 0.0047") thickness and the punch may be set to accept tape of between 17.5 mm (11/16") and 25.4 mm (1") in width. Both supply and take up bobbins are fitted and can be used with reels of tape up to 20 cm in diameter. The punch includes its own power supply.

Connection to the System

Connection to the system may be via the programmed or an input/output processor channel.

Mounting

The punch is available assembled for mounting in a standard 19" rack or as a free standing unit.

CARD READER

P806-102 Card Reader

Figure 17.5 shows the P806-102 card reader.

Main Controls and Indicators

Power On Switch - A two position switch mounted externally, used to switch the mains power to the punch On or Off.

DC On Switch - A two position switch mounted to one side of the Power On switch, used to switch the internal d.c. supply to the punch.

Tape Feed Switch - A two position switch mounted externally and spring loaded to the off position. When the switch is depressed tape is fed from the supply reel to the take up bobbin without punching.

Feed Holes/Code Switch - A three position switch mounted externally and spring loaded to the central, off, position. When the switch is depressed tape is fed from the supply reel to the take up bobbin and either feed holes only or feed holes and code holes in all tracks are punched, with respect to the depressed position of the switch.

Apart from the main controls, indicator lights are mounted externally to indicate: d.c. power on, supply tape low, and certain errors. Internal switches are also fitted to control the take up bobbin.

Basic Specifications

Operating Speed	- 75 characters per second
Size	- Width 330 mm, height 190 mm, Depth 432 mm.
Weight	- 13 Kilograms.
Tape Size	- Width 17.5 to 25.4 mm (11/16 to 1") Thickness 0.08 to 0.1 mm (0.0031" to 0.0043").
Power	- 180 VA max.
Operating Temperature	- 0 - 45°C operating.
Relative Humidity	- 20 - 80% operating.

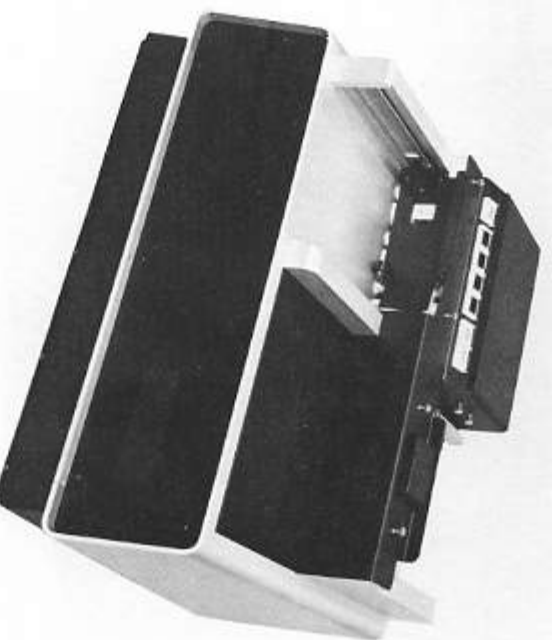


Figure 17.5

The P806-102 card reader provides the system with the ability to read data from 80 column cards at a transfer rate of up to 300 cards per minute. Card handling facilities in the form of an input hopper and output stacker enable the reader to handle up to 1000 cards without operator intervention for loading. The reader is of the photo electric type and employs a straight through card track with a vacuum picking mechanism, providing almost jam free operation and extremely long card life.

The reader is free standing and includes its own power supply.

Connection to the System

Connection to the system may be via the programmed or an input/output channel.

Main Controls

Power On/Off Switch - A two position switch mounted externally on the back of the reader, used to switch the mains power to the reader On or Off.

Mode Switch - A three position switch mounted externally on the back of the reader, used to select the mode of operation of the reader:

OFF The reader is inoperative.

LOCAL The reader is operative under the control of the operator.

REMOTE The reader is operative under the control of the system.

Reset Switch - A push button switch mounted externally on the front of the reader, used to start or restart the reader in certain modes.

Stop Switch - A push button switch mounted externally on the front of the reader, used by the operator to stop the reader as required.

Apart from the main controls, lamps are provided to indicate the state of the reader and other switches are provided for the testing of the lamp and the setting of the reader for automatic or manual shutdown when necessary.

Basic Specifications

- Operating Speed**
 - 300 cards per minute.
 - Width 58.6 cm, height 41.2 cm,
 - Depth 45.7 cm.
- Weight**
 - 34.4 Kilograms.
- Card Specifications**
 - Standard 80 column card.
- Power**
 - 1650 VA starting, 600 VA running.
- Operating Temperature**
 - 15 - 25°C Limits imposed by cards.
- Relative Humidity**
 - 50 - 70%.

LINE PRINTERS

P809-002 Matrix Line Printer

Figure 17.6 shows the P809-002 matrix line printer.

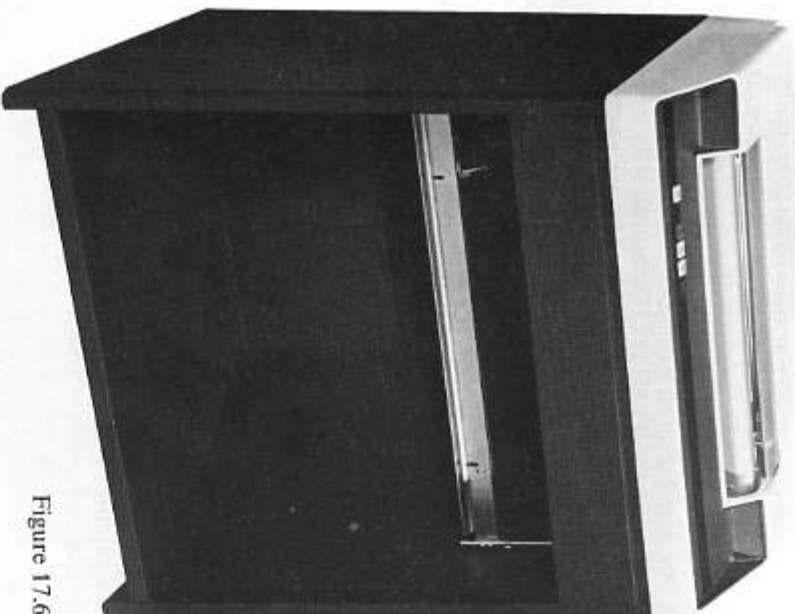


Figure 17.6

The P809-002 matrix line printer provides the system with the ability to produce a printed output at a rate of up to 200, 132 column lines per minute on standard fan folded paper, with a character set of 72 characters. Where necessary an output can be to a preset format and adjustment is possible to accommodate a paper width between 100 and 440 mm.

The carriage is a shuttling bar mounted on a support which moves in the horizontal plane between two side plates.

The printer is a free standing unit and includes its own power supply.

Connection to the system

Connection to the system may be via the programmed channel or input/output processor channel.

Main Controls

POWER ON - A pushbutton indicator holding switch mounted externally used to switch the main power to the printer on and when pressed again, off.

START/STOP - A pushbutton momentary indicator switch mounted externally. When pressed the indicator is lit and the printer is operational. When pressed again the indicator light is extinguished and the operator can use the TOP OF FORM and SINGLE LINE pushbuttons.

TOP OF FORM - A pushbutton momentary switch mounted externally whose action is inhibited when the START/STOP button is lit. When pressed in STOP mode the paper is advanced to the next top of form position.

SINGLE LINE - A pushbutton momentary switch mounted externally whose action is inhibited when the START/STOP button is lit. This pushbutton allows to advance the paper one line.

ERROR - An indicator which is lit when an error condition occurs.

Basic Specifications

Operating Speed	- 200 lines per minute.
Line Length	- 132 characters.
Size	- Width 700 mm, height 800 mm.
	- Depth 460 mm.
Weight	- approx. 80 Kilogram.
Paper Specification	- Single Copy 15 lb bond min. Multiple Copy up to 5 parts 11 lb bond with interleaved carbon. Paper width 100 - 440 mm.
Power Consumption	- 300 VA.
Operating Temperature	- 10 - 40°C.
Relative Humidity	- 20 - 80%.

P811-001 Line Printer

Figure 17.7 shows the P811-001 line printer.

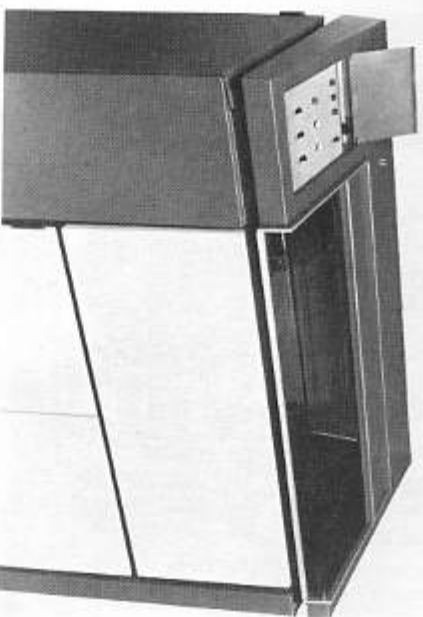


Figure 17.7

The P811-001 line printer provides the system with the ability to produce a printed output at a rate of up to 245, 132 character, lines per minute on standard fan folded paper. Where necessary an output can be to a preset format and adjustment is possible to accommodate various widths of paper, either single or multiple copies being available.

The printer is of the drum type with a character set of 64 characters, is free standing, and includes its own power supply.

Connection to the System

Connection to the system may be via the programmed or an input/output processor channel.

Main Controls

Power On/Off Switch - A two position switch mounted externally on the top of the printer, used to switch the main power to the printer On or Off.

On Line/Off Line Switch - A two position switch mounted externally on the top of the printer, used to switch the printer On or Off line from the system.

Paper Step Switch - A two position switch mounted externally on the top panel of the printer, spring loaded to the off position, and operative when the printer is off line. When depressed it causes the paper to be advanced by one line.

Top of Form Switch - A two position switch mounted externally on the top panel of the printer, spring loaded to the off position, and operative when the printer is off line. When depressed it causes the paper to be advanced to the top of form position.

Basic Specifications

Operating Speed

- 245 lines per minute.

Line Length

- 132 characters.

Size

- Width 1232 mm, height 1168 mm, Depth 622 mm.

Weight

Paper Specification

- 272 Kilogram.
- Single Copy, 15 lb bond min. Multiple Copy up to 6 parts 12 lb bond with interleaved carbon. paper width, 102-251 mm.

Power

Operating Temperature

- 500 V.A.
- 10 - 43°C.

Relative Humidity

- 30 - 80%.

P812-001 Line Printer

In all respects except basic specifications the P812-001 printer is the same as the P811-001 printer.

Basic Specifications

Operating Speed

- 670 lines per minute.

Line Length

- 132 characters.

Size

- Width 1232 mm, height 1168 mm, Depth 622 mm.

Weight

Paper Specification

- 362 Kilogram.
- Single Copy, 15 lb bond min. Multiple Copy up to 6 parts 12 lb bond with interleaved carbon. paper width, 102 - 251 mm.

Power

Operating Temperature

- 500 V.A.
- 10 - 43°C.

Relative Humidity

- 30 - 80%.

MAGNETIC TAPE EQUIPMENT

P831-002 Magnetic Tape Unit

Figure 17.8 shows the P831-002 magnetic tape unit.

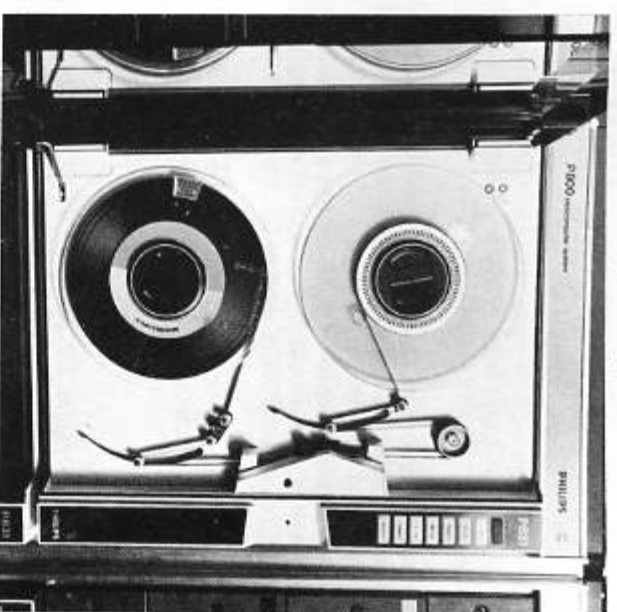


Figure 17.8

The P831-002 magnetic tape unit provides the system with the ability to transfer data to or from magnetic tape at a rate of up to 20k characters per second. Recording density is 800 bits per inch and a NZRI method of recording data in 9 track format is used. Tape handling is via a servo controlled drive unit and two 10.5 inch reels at a tape speed of 25 inches per second. The unit incorporates its own power supply.

Connection to the System

Connection to the system must be made via an appropriate tape formatter which is in turn connected to the system via an input/output processor channel. Up to 4 magnetic tape units may be connected to, and controlled via, a single formatter unit.

Mounting

The tape unit is assembled for mounting in a standard 19" rack, fitting being by hinges to the front of the rack frame. The unit may be fitted into either the basic or an extension cabinet.

Main Controls

All the main controls are situated externally on the front panel of the unit and include indicators within the push button switches.

Power - Used to switch the main power to the unit On or Off and to indicate power on.

Load - When initially pressed the switch causes the energising of the servo mechanism and the tape is wound taught. When pressed again the tape is advanced to the load point.

On Line - Alternate operations of the switch cause the unit to be switched on and off line respectively, the indicator is lit when the unit is on line.

White Enable - Alternate operations of the switch cause the unit to be switched between the Read/Write and the Read Only mode of operation, the indicators is lit when the unit is in the Read/Write mode.

Other switches are provided to operate the unit in the Off line mode giving the operator the facility to run the tape forward or backwards and rewind the tape as necessary.

Basic Specifications

Operating Speed	- Tape, 25" per second, 800 bits per in. Transfer, 20k characters per second.
Size	- Width 483 mm, height 622 mm, Depth 318 mm.
Weight	- 38 Kilograms.
Tape Specification	- Width 12.7 mm, Thickness 0.038 mm, Length 731 m, 267 mm reels.
Power	- 300 V.A.
Operating Temperature	- 2 - 35°C
Relative Humidity	- 15 - 95%
Size	- Width 483 mm, height 89 mm, Depth 508 mm.
Weight	- 11 Kilograms.
Power	- 100 V.A.
Operating Temperature	- 2 - 50°C.
Relative Humidity	- 10 - 95%

P831-004 Magnetic Tape Unit

This unit provides the system with the same facilities as the P831-002 Magnetic Tape Unit but with increased tape drive speed and transfer rate. In all other respects the respective units are the same,

Operating Speed Tape, 45" per second

800 bits per in.

Transfer, 36k characters per second.

P831-010 Tape Formatter

The P831-010 tape formatter provides the necessary control and timing to connect up to 4 P831-002 tape units to the system. It contains its own power supply and will normally be mounted in the back of the same rack as one of the drive units it controls. It is fitted with a power On/Off switch and indicator which will normally be accessible when the rear of the cabinet containing the unit is open.

P831-020 Tape Formatter

The P831-020 tape formatter provides the necessary control and timing to connect up to 4 P831-004 tape units to the system. It contains its own power supply and will normally be mounted in the back of the same racks as one of the drive units it controls. It is fitted with a power On/Off switch and indicator which normally is accessible when the rear of the cabinet containing the unit is open.

P831-006 Magnetic Tape Unit

This unit provides the system with the same facilities as the P831-002 Magnetic Tape Unit but with increased tape drive speed and transfer rate. In all other respects the respective units are the same.

Operating Speed Tape, 37.5" per second.
1600 bits per in.
Transfer, 60k characters per second.

P831-030 Tape Formatter

The P831-030 tape formatter provides the necessary control and timing to connect up to 4 P831-006 tape units to the system. It contains its own power supply and will normally be mounted in the back of the same rack as one of the drive units it controls. It is fitted with a power On/Off switch and indicator which will normally be accessible when the rear of the cabinet containing the unit is open.

P833-001 Cassette Drive Unit

Figure 17.9 shows the P833-001 cassette drive unit.

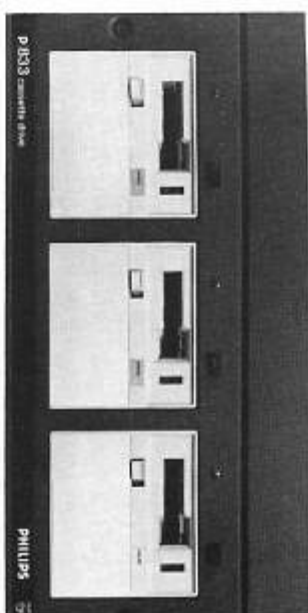


Figure 17.9

The P833-001 cassette tape unit provides the system with the ability to transfer data to or from cassette tape at a transfer rate of up to 750 characters per second.

The tape unit drives the cassette tape at a speed of 7.5 inches per second and data are recorded or read serially at a density of 800 bits per inch on two separate tracks.

Connection to the System

Connection to the system may be via the programmed or input/output processor channel and up to 3 units may be controlled by a single control unit.

Mounting

The unit is assembled for mounting into a chassis which is itself designed for mounting in a standard 19" rack. Up to 3 units may be mounted into one chassis and each chassis contains a power supply and control unit to power and handle the units fitted into it.

Main Controls

Only one external control is fitted to the front of the unit, the Retrieval Knob, this knob is depressed to release and enable removal of a cassette. The knob is locked and unable to be depressed when a unit is in operation. Indicators on the front of the unit show when the unit is locked and the approximate amount of tape used at any one point.

Basic Specifications

Operating Speed

- Tape 7.5" per second, 800 bits per in.

Transfer 750 characters per second.

- Width 123 mm, Height 139 mm, Depth 280 mm.

- 3.5 Kilograms.

- Width 3.81 mm, Length 86 m.

- 24 V, 0.85A steady.

- 0 - 50°C.

- 5 - 95%.

Operating Temperature

- 0 - 50°C.

- 5 - 95%.

Relative Humidity

- 5 - 95%.

P833-152 Cassette Tape Controller

The P833-152 Cassette Tape Controller provides mounting facilities for up to 3 P833-001 cassette units and includes its own 24V power supply unit and control circuits.

Basic Specifications

Size

- Width 483 mm, height 178 mm, Depth 617 mm.

Weight

- 15 Kilograms.

Power

- 80 V.A.

Operating Temperature

- 0 - 50°C.

Relative Humidity

- 5 - 95%.

MAGNETIC DISC EQUIPMENT

P824-002 Moving Head Disc Unit

Figure 17.10 shows the P824-002 moving head disc unit.



Figure 17.10

This moving head disc unit provides the system with the ability to transfer data to or from a magnetic disc cartridge at a rate of up to 312k characters per second after initial access to the disc area required. Head positioning is carried out by an electro-mechanical mechanism with a positive positioning detent, the average positioning time being only 30 ms. Data are recorded on or read from the disc serially, 78k characters (or bytes) per track being possible. Each surface of the disc contains 200 tracks providing an overall capacity of 2.7M characters. A second, fixed disc is incorporated within the unit. The moving heads for this are combined within the overall head mechanism and thus the capacity, transfer rate and access time are all the same as for the exchangeable cartridge, overall capacity of the unit with the fixed disc being 5.4M characters. Apart from the drive and head position mechanism the unit contains its own power supply and all the necessary control logic for correct operation.

The exchangeable recording disc is a Philips 14" mono disc cartridge, P842-100, and is fully compatible with the IBM 5440 type of cartridge with 16 sectors.

Connection to the System

Connection to the system is via an input/output processor.

Mounting

The complete unit is assembled for mounting within a standard 19" rack by means of mounting kit P849-039 and fitting may be in either the basic or an extension cabinet. The drive unit is slide mounted within the rack to enable cartridge changing and engineering maintenance.

Main Controls

All the main controls are mounted externally on the front panel of the unit and incorporate their own indicators.

Power On/Off Indicator - Is lit when the power is switched on.

Start/Stop Switch - A push button switch used to start and stop the drive to the disc.

Apart from the main controls indicator lamps are fitted on the front panel to indicate Cartridge Exchange and certain fault conditions.

Basic Specifications

- | | |
|------------------------------|---|
| Operating Speed | - Disc rotation, 2400 r.p.m. |
| | - Transfer, 312k characters per second. |
| | - 12.5 msec. |
| Average Latency | - 33 ± 2 msec. |
| Average Access time | - Width 480 mm, Height 262 mm (3U) |
| Size, Drive Unit | - Depth, 752 mm. |
| Weight, Drive Unit | - 60 Kilograms. |
| Power | - 150 VA running (600 VA starting). |
| Operating Temperature | - 10 - 35°C. |
| Relative Humidity | - 20 - 80%. |

P825-007 Moving Head Disc Unit

Figure 17.11 shows the P825-007 moving head disc unit.

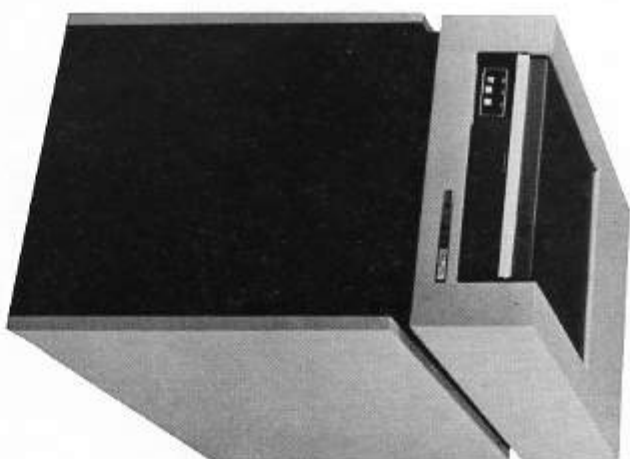


Figure 17.11

This moving head disc unit provides the system with a mass memory random access device with an exchangeable 5-disc cartridge (P825-100). The cartridge is driven by a $\frac{1}{2}$ hp spindle motor and is placed on the spindle by opening the hinged shroud cover on top of the unit.

The disc pack contains 5 recordable surfaces each one having 411 tracks of which 7 are spare ones. Data are recorded on or read from the disc serially. Recording is possible up to 21.5k characters (bytes) per track. The overall capacity of the disc pack is 40M bytes.

Head positioning is carried out by a closed loop proportional servo system. The carriage is driven by a voice coil linear actuator with position feedback provided from the disc pack servo service. The average positioning time is 30 ms.

Connection to System

Connection to the system is via an input/output processor.

Main Controls

All the main controls are mounted externally on the unit's front panel.

Start Switch to start and stop the unit. It is lit when pressed.

Ready Indicator which is lit when the pack is up to speed, the heads are loaded and no fault condition exists.

Fault Lights when a fault condition occurs. When pressed in that case the fault flip-flop is cleared.

Apart from the main controls on the front panel two switches are mounted on the back panel to connect the mains and the power supply unit.

Basic Specifications

Operating Speed	- Disc rotation, 3600 r.p.m.
Average Latency	- 8.33 msec.
Average Access time	- 30 msec.
Height	- 34.0 in. (864 mm)
Depth	- 34.0 in. (864 mm)
Width	- 19.0 in. (483 mm)
Weight	- 100 Kilograms.
Power	- 150 VA (standby), 620 VA (operation).
Operating temperature	- 15 - 32°C.
Relative Humidity	- 20 - 80%.
Data Transfer Rate	- 1.2M char./sec.
Disc Diameter	- 14 inches.
No of discs	- 5 (3 data and 2 cover plates).
Servo Service	- 1
Recording Surfaces	- 5
Tracks per Surface	- 404 plus 7 spares.
Tracks spacing	- 0.0052 inch nominal.
No. of Servo heads	- 1
No. of Recording heads	- 5

DISPLAY EQUIPMENT

P818-001 Display

Figure 17.12 shows the P818-001 display.



Figure 17.12

The P818-001 display provides the system with a table-top terminal which displays its information on a 12" screen size, 80 characters per line. The attached keyboard allows 64 ASCII alphanumeric and symbols. The number of lines displayed on the screen is 24 lines.

Connection to the System

Connection to the system is done via the current loop interface implemented on the AMA8C.

Main Controls

Power On/Off switch - An external two position switch used by the operator to switch the mains power to the display on or off.

LINE RDY

- indicator which is lit red when the display is operational.

PARITY ERROR

- lights red in case of a parity error.

PARITY RESET

RESET

ON LINE/OFF LINE

- springloaded pushbutton which must be pressed when a parity error occurred.
- springloaded pushbutton. When pressed all internal functions are reset and the screen is cleared.
- rocker switch.
- ON LINE - the display is connected to the system.

TPWR/TTY

- OFF LINE - the display is operational but not connected to the system.
- rocker switch.

HIGH RATE/LOW RATE

- TPWR - lower case and upper case facility.
- TTY - upper case facility.
- rocker switch.

FULL DUP/HALF DUP

- Its use is determined at installation time.
- rocker switch.
- FULL DUP - full duplex. Used for echoplex technique where the computer echoes back each character for display on the screen.
- HALF DUP - half duplex. Characters are directly displayed on the screen.

Contrast

- thumbwheel to adjust the brightness of the characters on the screen.

Basic Specifications

- No of lines - 24
- No of char. per line - 80.
- Transmission rate - 110 to 9600 bauds.
- Transmission mode - asynchronous.
- Parity selection - by switch: odd, even, none.
- Interface - current loop.
- Size - Length 381 mm, Height 292 mm, Depth 508 mm.
- Weight - approx. 17.4 kg.
- Power - 200 VA.
- Operating Temperature - 10 - 40°C.
- Relative Humidity - 10 - 90%.

P818-002 Display

This display provides the same functions as the P818-001 but it has a V24 interface.

Connection to the system

Connection to the system may be done via the integrated serial control unit or the P845-040/002 Serial Control Unit or via Data Communication interfaces such as ALCU2, ALCU4 or the AMA8A.

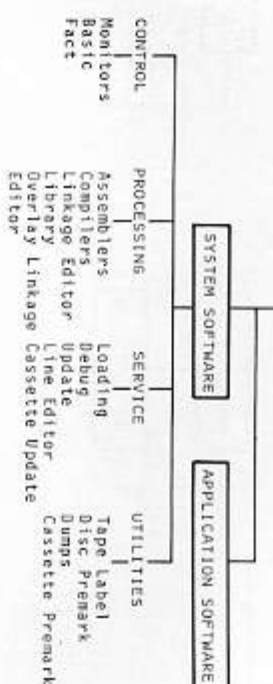


Figure 18.1 Standard System Software and Application Software

Software consists of two main divisions, as shown by figure 18.1. The application software shown is not further divided as this represents the programs a user writes to carry out his processing requirements, these of course will vary considerably from user to user. System software consists of all those programs a user may employ to efficiently produce and execute his application software and is made up of the control, processing, service and utility programs shown by figure 18.1. Full descriptions of the available system software are covered in the appropriate software manuals and therefore only a brief description of the software is given here.

All software may be of a modular construction, and in the case of the monitors, a user may select the modules he requires at the time of generating the system. The main advantages offered by modular programming are:

1. Modules may be written in different source languages and by different programmers thus enabling an efficient and speedy solution to any problem.
2. Common routines may be written and held for use by a number of programs.
3. Testing, error detection and correction procedures are simplified.
4. Updating is simplified.

Figure 18.2 shows the method of modular construction used within the monitors as an example of modular programming. Each monitor may be assembled from only those modules it requires.

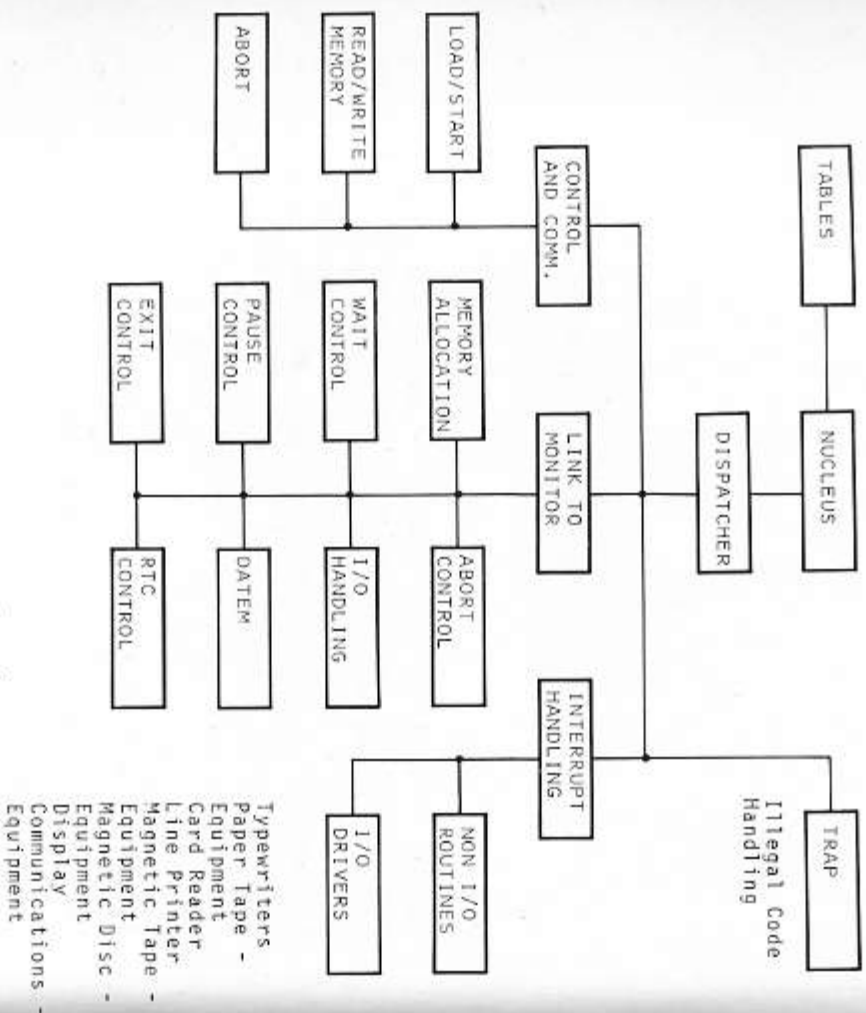


Figure 18.2 Modular structure of monitor



Figure 18.3 Stand Alone Software

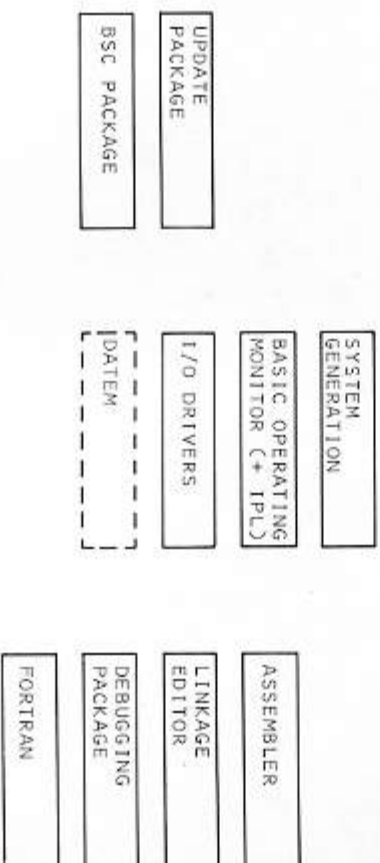


Figure 18.4 Software for Basic Operating System

System software is available in stand alone software or monitor controlled versions. Stand alone programs are completely self contained and thus do not require to use any of the facilities available from the monitors, whilst monitor controlled programs are available for paper tape, cassette tape and disc oriented systems. Figures 18.3 to 18.9 show the standard system software configurations.

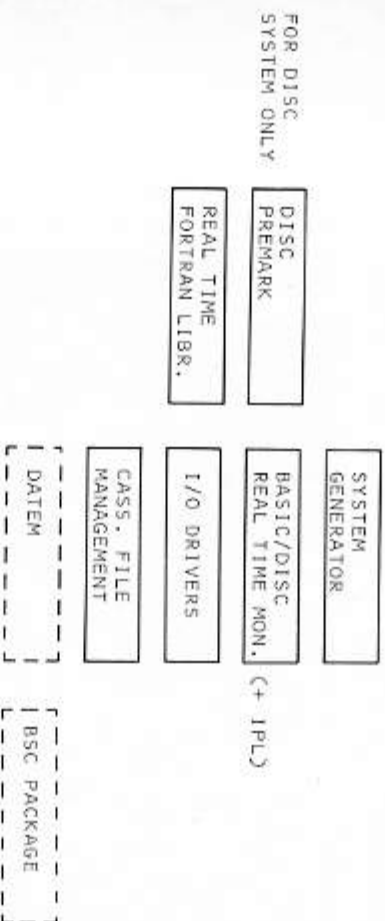


Figure 18.5 Software for Basic and Disc Real Time System

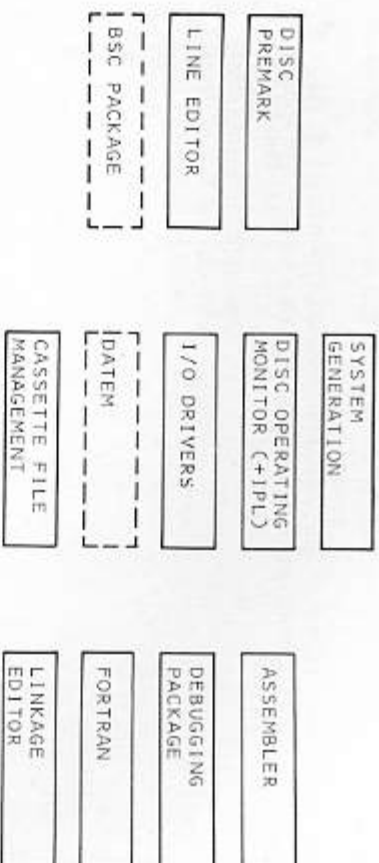


Figure 18.6 Software for Disc Operating System

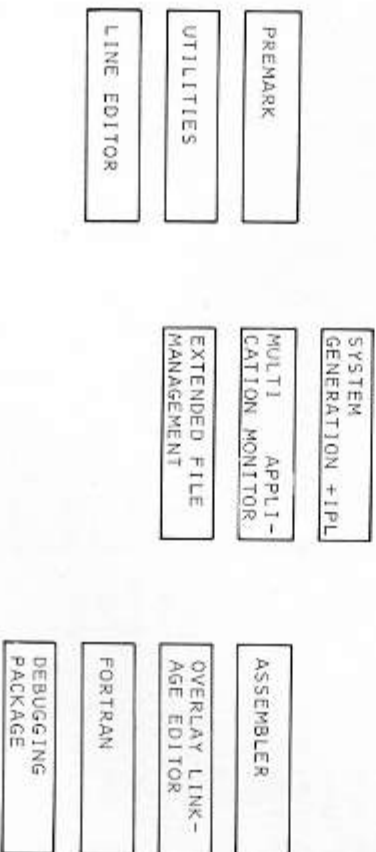


Figure 18.7 Software for Multi Application System



Figure 18.8 Software for Cassette Operating System

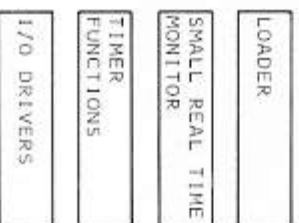


Figure 18.9 Software for Small Real Time System

CONTROL PROGRAMS

The loading, preparation and supervised execution of application and certain system software may be handled by control programs, known within system software as monitors. Being of modular construction a user may select only those modules which he needs when generating his system, and if necessary expand the monitor facilities as and when the hardware system is enhanced.

There are seven monitors currently available, one for each of the software configurations that require a control program. The monitors available are:

1. Basic Operating Monitor.
2. Basic Real Time Monitor.
3. Disc Operating Monitor.
4. Disc Real Time Monitor.
5. Cassette Operating Monitor.
6. Small Real Time Monitor.
7. Multi Application Monitor.

Basic Operating Monitor

The basic operating monitor provides the system with the ability to handle controlled system software and application software on a non-real time basis. The monitor is paper tape orientated in its standard form but may be extended to handle other peripherals as necessary. The use of the systems interrupt handling and a facility of scheduled labelling, which allows for the immediate commencement of a specified routine on completion of a specified input/output process, enables the monitor to exercise control of programs speedily and efficiently. The normal use of the basic operating monitor is to provide the necessary control when a user is producing and testing applications software prior to the use of such software in a real time environment.

The minimum configuration requirements for operating with the basic operating monitor are 8k words of memory and an operator's typewriter with associated paper tape equipment, the monitor itself occupying between 3k and 5k of central memory. In the smallest case only the operator's ASR and associated paper tape equipment together with the necessary program control modules may be specified.

Basic Real Time Monitor

The basic real time monitor provides the system with the ability to handle controlled application and certain system software on a real time basis. This facility is based on a use of time sharing, or slicing, between different programs which are running at the same software level; and a system of software and hardware levels to efficiently handle the input/output requirements of a number of programs. All the facilities available to the Basic Operating Monitor, together with

control facilities necessary for connecting programs to software levels and timers, and the organization of the use of common subroutines and buffer areas, are available to the Basic Real Time Monitor.

The minimum configuration requirements for operating with the basic real time monitor are 8k words of memory and an operator's typewriter with associated paper tape or cassette tape equipment, the monitor itself occupying upwards of 3k of memory. In the smallest case only the operator's ASR and associated paper tape equipment, together with the real time clock and other necessary program control modules may be specified.

Disc Operating Monitor

The disc operating monitor provides a disc orientated system with all the facilities available to the Basic Operating Monitor, and in addition provides the necessary control for the secure allocation and utilization of both user and system files within any system. Both system and user programs that are to be used are held on a disc within the system, and are called into central memory and executed as required. The running of user programs or the updating of system information is carried out during a session, which must be commenced by a specific user identification, and only the files of the declared user may be accessed for writing during any specific session, the files of other users may however be read. All user identifications including the system are catalogued and each identification refers to a library of files which is only accessible via the catalogue and under monitor control, thus ensuring security of data.

Throughout a session processing is carried out within temporary files but at any time during the session a user may retain files by keeping them within his library.

The minimum configuration requirements for operating with the disc operating monitor are 16k words of central memory, an operator's typewriter and one disc.

Disc Real Time Monitor

The disc real time monitor provides a disc orientated system with all the facilities of the basic real time monitor and the disc facilities of the disc operating monitor, in addition the monitor is able to allocate central memory to running programs which have been loaded from the disc and where necessary restore programs to the disc to make central memory space available for higher priority programs.

The minimum configuration requirements for operating with the disc real time monitor are 8k words of central memory, an operator's typewriter, and one disc.

This Monitor may be extended with the Extended File Management Package.

Cassette Operating Monitor

The Cassette Operating Monitor (COM) is a monitor which handles one program at a time and may be considered as a cassette tape oriented program development tool.

At system generation time, the user creates his own system cassette, on which the monitor is the first program, preceded by an Initial Program Loader (IPL). The monitor is loaded by this IPL, which is loaded by bootstrap according to the data switches on the CPU control panel.

Then the user program or a processor is loaded. If the operator communication package is included and used for this purpose, separate commands must be given to load and start. If the cassette file management package is included, one single command will be enough to seek, load and start a program.

The cassette file management (CFM) package is used to handle I/O operations on cassette tape according to certain ECMA standards, one of which is the type of labelling of the tape. The CFM will accept three types of increasing labelling complexity: Basic, Compact and Extended. The system software is given in Compact type of labelling, which allows the handling by the COM of single-track, multi-track and multi-volume files as well as multi-file tracks and volumes. Files are preceded by headers and followed by End of File records, tracks end with End-Of-Track records, volumes (i.e. one complete cassette) with End-Of-Volume records. This is all handled automatically by the cassette file management package; it includes a number of control commands by means of which the user can write or search headers, run a program, etc.

The monitor itself handles the standard interrupt signals, controls I/O operations and executes functions requested by the user in his program by means of monitor requests, e.g. requesting and releasing temporary bufferspace in memory, waiting for events, making exits, etc.

The monitor modules are centered around a dispatcher, which determines on the basis of interrupt signals and priority levels which routine or program must be executed.

Although the COM is designed to handle one program at a time, a form of multitasking can be achieved by using scheduled label routines. These routines are attached to the specification of a monitor request and enable a program to run concurrently with, for example, an I/O operation.

Although the COM is cassette tape oriented, other peripherals can be handled as well. This can all be determined by the user at system generation time.

Small Real Time Monitor

The Small Real Time Monitor is developed for dedicated computer applications requiring a small and fast monitor. The monitor is paper tape oriented.

Included in the monitor are timer functions for control of the user programs. Fourteen software priority levels allow multiprogramming between user tasks, one or more programs may be connected to the same level.

The monitor is upward compatible with the Basic Real Time Monitor.

Multi Application Monitor

The Multi Application Monitor is particularly well suited for a number of applications:

- multi tasking applications where a large memory size (up to 128k) allows more resident programs or several transient programs to be in core, improving response time and overall performances.
- foreground/background applications where program debugging can be made concurrently with a real-time process.
- data communication applications where many buffers and tables have to be resident due to fast access time.

The Multi Application Monitor is a disc oriented monitor and has a clear open ended structure; at each application corresponds a sub-machine defined by:

- several priority levels,
- several allocated or shared peripheral devices (spooling),
- several memory partitions,
- several disk file libraries.

More than one multi-tasking or real-time sub-machine exist; programs can be connected to a real-time clock or timer, several disk resident programs can be in memory at the same time (multi-transient areas).

A batch processing sub-machine supports other system components including Assembler, Overlay Linkage Editor, Full Fortran Compiler, Line Editor etc. This sub-machine is specially oriented towards program development. Each sub-machine and the monitor itself are individually protected. The Monitor can be extended with the Extended Disc File Management Package which adds to the existing system data base facilities with direct and sequential access, variable length data records, indexed organisation, file protection and on-line updating.

A set of operator commands is available e.g. to create or suppress a sub-machine, to allocate or deallocate memory for a sub-machine, to assign peripheral devices or files, to start or stop tasks inside sub-machines.

DATEM

DATEM is a datacommunication monitor extension to the Basic Operating Monitors, the Disc Operating Monitor and the Basic and Disc Real Time Monitors.

It provides the system with basic data communication facilities. The standard features of the monitors remain available for the system. The extension takes care of the following functions in a data communication configuration:

- Connection to the line (leased lines and switched lines).
- Read or write data.
- Error control.
- Time-out control.
- Data control (wait for data, polling and selecting, stop the transmission on detection of special characters).

BSC

BSC is the Binary Synchronous Communication line procedure package which may be used for synchronous communication. It handles the line control of the transmitting and receiving stations.

PROCESSING PROGRAMS

These programs consist of assemblers, compilers, linkage editor and overlay editor available to a user for the production of his application software. Various versions of the programs are possible to meet the requirements of different systems and in most cases a stand alone and a monitor controlled version are available.

Assemblers

The assemblers convert source modules written in assembly language into object modules suitable for linking to other object modules or for loading and execution. Each line of a source module is written in assembly language and represents one central processor instruction, word or block of data or directive, to control the assembly process. Additional features available include error reporting and recovery, assembly listing and the selection of the peripheral devices to be used during processing.

Two versions of the assembler exist: a stand alone version and a monitor control version (either Basic or Disc oriented).

FORTAN Compilers

The FORTAN compilers translate FORTAN source programs into object modules to be processed by the Linkage Editor or Overlay Editor with the Mathematical Library. The result of the editing process is a self-contained executable program which can run under control of the monitor. The compilers are self-initializing and do not require reloading between successive compilations. The Full FORTAN compiler produces object modules in interpretive code, which is translated into executable machine code instructions at run time by the object code interpreter routine linked to the FORTAN program. The High-Speed FORTAN Compiler accepts the same source language as the Full FORTAN compiler with some extension for disc random access, and produces machine code object directly.

For systems controlled by the Basic Operating Monitor a transcoder is available to translate interpretive object modules into directly executable machine code.

The Real Time FORTAN system is a system in which user written FORTAN programs run under control of a real time monitor. The Real Time FORTAN library consists of a set of routines which are called by the FORTAN program whenever their use is required.

Linkage Editor

The Linkage Editor is available for the Stand Alone, Basic and Disc Operating Systems providing the facility to link separate object modules either for direct loading and execution or for output (BOS only), to be loaded later or used within a further linkage process. By linking, all the advantages of modular programming are easily available. Modules which are to be linked are written containing specified external references and entry points to be used during linkage, and the control of the linkage process by the operator, allows for the selection of the peripherals and mode to be used during processing. In addition the program provides the listing of a map reports errors during processing.

Overlay Linkage Editor

This processor runs under control of the Multi Application Monitor. It applies for large programs which cannot fit in the available partition. The Overlay Linkage Editor produces from a set of object modules a segmented program organised in an overlay structure which is transparent to the user. It satisfies all the external references and produces calling sequences for loading the different segments. In case of one segment the processor can also be used as a simple Linkage Editor. After processing a load module is produced recorded on a temporary load file. This load module may be executed and/or kept in library. A number of options may be typed in e.g. to specify an absolute loading address, the start address of a common area or the specification which library will be scanned, and some information required by the Debugging Processor.

SERVICE AND UTILITY PROGRAMS

The programs within these groups provide the user with all the facilities required to set up, run, and maintain the system apart from the tasks of initial program production.

Debugging

Debugging programs are available to enable rapid error detection within program modules, and to provide the programmer with the ability to stop a program at specific points so that the contents of memory and/or registers may be checked or altered as necessary.

Update

An update program is available for stand alone systems or for use with BOM providing the facility to insert or delete lines or modules at source level and to insert or delete modules at object level. Initial control of the update program is carried out by the operator or programmer from the operator's typewriter, and various options exist to enable the system's other peripheral devices to be used during the complete update process.

The minimum configuration requirements for operating the update facility are 8k words of central memory, an operator's typewriter, and high speed paper tape reader and punch.

Line Editor

The line editor, available for use within the disc operating system configuration, provides all the facilities of the Update Package and an additional facility to enable the alteration of a specified character string wherever such a string appears in a module.

Cassette Update

The Cassette Update allows the user of the Cassette Operating System to update his files, libraries and sources or object modules. The Update Package at file level, module level or line level and comprises functions as copy, skip, delete, insert and list. Editing is done by means of control commands of which some pertain to a certain level. It is possible to switch from one level to another during an edit run.

Utility Programs

These programs are used by the user during the setting up of the systems files, and where necessary during the normal running of the system to provide the marking and labelling facilities required by certain peripherals and the information required by certain processes.

BASIC

BASIC is a stand alone system for compiling and executing programs written in the BASIC (Beginners All-purpose Symbolic Instruction Code) language. The BASIC system consists of a monitor and a compiler. It is a conversational system, on which up to 16 users can work simultaneously from terminals. A time-slicing mechanism, which divides processing time in equal parts over all terminals, makes the system appear to each user as occupied by him alone. The actual execution of programs is done by incremental compilation: each statement is compiled separately, and executed immediately. The generated object code is not stored, to economize on memory space.

The system is completely memory resident. It needs a high speed paper tape reader, an ASR typewriter for each user, and depending on the number of users 8 to 20k words of memory.

FACT

FACT, which stands for Facility for Automation Control and Test, is a software system operating as a programmable controller, able to perform the control functions generally required in control and automation projects, such as production control, traffic control, functional test of integrated circuits and printed circuit boards, and various types of security systems. The control functions are provided by FACT user programs, written in simple instruction statements. The FACT system translates the instructions into control signals for the process, and transmits signals from the process to the control program. The FACT system is memory resident, and occupies only 0.5k memory words. An Update processor of 0.5k memory words is available to produce and change FACT user programs.

Appendix 1

Peripheral Manufacturers

P841	Operator's Typewriter	- Teletype Corporation
P842	Matrix Printer	- Philips Terminal Systems
P801/802	Paper Tape Reader	- Digitronics Corporation
P803	Paper Tape Punch	- Facit
P809	Matrix Line Printer	- Philips
P811/812	Line Printers	- Data Products
P806	Card Reader	- Documentation
P831	Magnetic Tape Drive	- PERTEC
P833	Cassette Tape Drive	- Philips
P824	Moving Head Disc	- Philips
P825	Moving Head Disc	- Control Data
P818	Visual Display Unit	- Hazeltine

- A**
- Accessing an Instruction 8-4
 - ACN 8-7
 - Additional Standard features 14-1
 - Address Generator 2-5
 - Addressing 1-4, 10-7
 - Addressing Cycle T1 8-5
 - Addressing Cycle T2 8-6
 - Addressing Subroutine 8-2
 - Address switches 12-5
 - ALCU2 15-1
 - ALCU4 15-1
 - ALU 2-3
 - AMA8A 15-1
 - AMA8C 15-1
 - AMA16 15-2
 - Application Software 18-2
 - Arithmetic Instructions 7-6
 - Arithmetic Unit 2-1
 - Assemblers 18-11
- B**
- BASIC 18-13
 - Basic Mounting Boxes 16-1
 - BIEC lines 9-8
 - BIO lines 9-7
 - BOM System 18-3, 18-7
 - Bootstrap 13-1
 - Branch Instructions 7-8, 8-2
 - BRTM System 18-4, 18-7
 - BSC 18-11
 - BSYN 9-6
 - Bus Address Lines 9-8
 - Bus Control Functions 9-1
 - Bus Control Signals 9-5
 - Bus Data Lines 9-7
 - Bus Interrupt Lines 9-8
 - Bus Priority and Selection system 9-3
 - Bus Signals Lines 9-5
 - Bus System 1-5
- BUSRN** 9-5
- C**
- C Multiplexer 2-4
 - Cabinets 16-1
 - Card Reader 17-1, 17-13
 - Cassette Update 18-13
 - Cassette Operating Monitor 18-6, 18-8
 - Cassette Tape Equipment 17-1, 17-22
 - Central Processing Unit 2-1
 - CHA 9-8
 - Character Handling Instructions 7-8
 - CIO 10-4
 - Clear Button 12-4
 - CLEARN 9-8
 - Command Exchanges 9-2, 9-6
 - Comparator 10-1
 - Connection to the System 17-2, 17-3
 - Control Buttons 12-3
 - Control Instructions 7-9
 - Control Panels 1-4, 12-1
 - Control Programs 18-7
 - Control ROM 2-5
 - Control Units 1-1, 10-1, 11-2, 11-5, 17-2
 - CR Register 2-1
- D**
- D Multiplexer 2-4
 - Data Communications 15-1
 - Data Exchanges 9-2, 9-6
 - Data Flow 8-1, 11-8, 11-14
 - Data Format 3-2
 - Data Lamps 12-2
 - Data Switches 12-2
 - DATEM 18-10
 - Debugging Software 18-12
 - DIOS 15-2
 - Diagnostic Box 15-2
 - Direct Memory Access 11-18
 - Display Equipment 17-1, 17-26
 - Display Lamps 12-2, 12-5

Display Memory Contents	13-8	Interrupt Mode	11-7
Display Register Contents	13-11	Interrupt System	10-1
DOS Software	18-5, 18-8	I/O Typewriters	17-1, 17-4
DRTM System	18-4, 18-8	IPL Button	12-4
E		K	
Electrical Supplies	16-5	K Register	2-5
Environmental Conditions/Control	1-5, 16-5	L	
Equipment Shelves	16-1	L Register	2-4
Execute Cycle	8-7	Line Editor	18-13
Extended Control Panel	12-5	Line Printer	17-1, 17-15
External Transfer Instructions	7-9	Linkage Editor	18-12
F		LM Button	12-3
FACT	18-13	Load Switch	12-5
Fortran Compilers	18-11	Loading	12-1
Full Control panel	12-1	Load Address	13-1
G		Load Memory	13-6
General Purpose Bus	9-1, 11-1	Load Register	13-10
General Specifications	1-4	Load/Store Instructions	7-6
GF Register	2-2	Logical Instructions	7-7
		Loop Counter	2-5
		LR Button	12-3
H		M	
Hardware Structure	2-1	MAD Lines	9-7
I		Magnetic Disc Equipment	17-1, 17-24
Initial Program Loader	13-1, 13-5	Magnetic Tape Equipment	17-1, 17-19
Input/Output Capability	1-4	Master Units	11-5
Input/Output Instructions	7-9	Matrix Printer	17-6
Input/Output Processor	11-12	MC Button	12-4
Input/Output Structure	11-1	Memory	1-2, 4-1
Installation	16-4	Memory Addressing	4-3
Instruction Formats	7-1	Microdiagnostics	1-4, 14-7
Instruction Microprogram	8-2	Microprogram Addressing	
Instruction Set	1-5, 7-1, 7-5	Routine	8-3
Instruction Timing	7-5	Minipanel	12-4
INT Button	12-4	MIOS	15-2
Integrated Serial C.U.	14-2	Miscellaneous Functions	9-5
Interfacing	16-5	Miscellaneous Signals	9-8
Interconnection between Units	16-1	MMU	5-1
Interleaving	1-3	Mode Buttons	12-3
Interrupt Action	10-3	Modem Panel	15-2
Interrupt Handling	9-5, 10-1, 10-2	Modular Construction of	
		Monitors	18-7
		Mounting Boxes	16-3

Move Table Instructions	7-10	RSLN (Reset Signal)	9-8
M Register	2-4	RST Button	12-3
MSN (Master Selected)	9-6	RUN Button	12-3
Multi Application Monitor	18-5, 18-9	Run Lamp	12-2
Multiple Control Units	17-2	S	
O		S Register	2-4
OK/O/KI	9-6	Safety Key Switch	12-1, 12-4
Operand	7-4	SCEN	
Operating the CPU	12-1	(Scan External Interrupts)	9-8
Overlay Linkage Editor	18-12	Scratchpad	2-2
P		Service Buttons	12-4
Page Fault Handling	5-3	Service programs	18-12
P Register	2-1, 10-4	Shift Instructions	7-8
Peripheral Equipment	17-1	Signal Exchange	11-6
Peripheral Manufacturers	A-1	Slave Units	11-5
PL Register	2-1	SLOCUS	15-1
Power Failure - Automatic Restart	14-1	SLOCUS	15-1
Power Lamp	12-1	Small Real Time Monitor	18-9
Power Supply	1-5, 17-2	Software	18-1
Preset Switch	12-6	SPYC (Scan Priority Chain)	9-5
Priority Chain (Bus)	9-2	SRTM	18-9
Priority System (Interrupts)	10-1	Stacking	10-7
Processing Programs	18-11	Stand Alone Software	18-3
Program Loading	13-1	Standard Initial Program Loader	
Programmed Channel	11-7	System	13-3
PSW Register	2-1, 10-4	System Components	1-1
Punched Tape Equipment	17-1, 17-9	System Mode	1-2
PWFN (Power Failure Signal)	9-8	System Programs	14-10
		System Software	13-1
Q			18-1
Qualification and Response Signals	9-7	T	
Q Register	2-4	Timing Control	9-5
R		TMEN (Timing Signal)	9-6
Read Memory	12-6	TMPN (Timing Signal)	9-6
Read Register	13-11	TMRN (Timing Signal)	9-6
Real Time Clock	14-2	TPMN (Timing Signal)	9-6
Registers	1-4, 2-1	Transportable Panel	12-4
Register Address Switches	12-2	Trap Action	7-5
RM Button	12-3	TRMN (Timing Signal)	9-6
ROM Address Register RA	2-5	U	
RR Button	12-3	Update Software	18-12
		User Mode	14-10
		Utility Programs	18-12, 18-13

V

Visualisation Panel
V24 Control Unit
V28CM

15-2
17-3
15-2

W

Wait Mode
Word Format
Write (Bus Signal)

11-7, 14-5
1-5, 3-1
9-8